THEREFORE WHAT IS CLAIMED IS:

1. A material comprising a porous polydendrimer with uniform pores of tunable size.

2. The material according to claim 1 wherein the porous polydendrimer is a periodic mesoporous polydendrimer.

3. The material according to claim 1 wherein the porous polydendrimer is a periodic macroporous polydendrimer.

4. The material according to claim 2 wherein the periodic mesoporous polydendrimer is periodic mesoporous dendrisilica.

5. The material according to claim 3 wherein the periodic macroporous polydendrimer is periodic macroporous dendrisilica.

6. The material according to claim 4 or 5 wherein the dendrisilica is made from dendrimer $Si[(C_2H_4)Si(OEt)_3]_4$ (**1**).

7. The material according to claim 4 or 5 wherein the dendrisilica is made from $Si[(C_2H_4)Si(Oi\text{-}Pr)_3]_4$ (i-Pr = isopropoxy) (**2**).

8. The material according to claim 4 or 5 wherein the dendrisilica is made from dendrimer $Si[(C_2H_4)Si((C_2H_4)Si(OEt)_3)_3]_4$ (**3**).

9. The material according to claim 4 or 5 wherein the dendrisilica is made from dendrimer $[((EtO)_3Si(C_2H_4))_3]SiCH_2Si[(C_2H_4)Si(OEt_3)]_3$ (**4**).

10. The material according to claim 1, 2, 3, 4 or 5 wherein the polydendrimer is made of a single type of dendrimer comprising a polymerizable group at an outmost shell of the dendrimer.

11. The material according to claim 1, 2, 3, 4 or 5 wherein the polydendrimer is a mixture of two or more dendrimers, each dendrimer of the mixture comprising a polymerizable group at an outmost shell of the dendrimer.

12. The material according to claim 10 or 11 wherein the polymerizable group is a tri-alkoxysilyl group or trichloro-silyl group.

13. The material according to claim 10 or 11wherein the polymerizable group is a vinyl group.

14. The material according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13 formed as a powder.

15. The material according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13 formed as a film.

16. The material according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13 formed as a monolith.

17. The material according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13 formed as a fiber.

18. A dendrimer tetrakis[2-(tris-(triethoxy, 2-ethylsilyl)silyl)ethyl]silane having a formula $Si[(C_2H_4)Si((C_2H_4)Si(OEt)_3)_3]_4$ (**3**).

19. A dendrimer bis-[tris-(2-(triethoxysilyl)ethyl)disila]methane having a formula $[((EtO)_3Si(C_2H_4))_3]SiCH_2Si[(C_2H_4)Si(OEt_3)]_3$ (**4**).

20. A method of synthesizing a porous polydendrimer with uniform pores of tunable size, comprising:

mixing a dendrimer with a template under conditions suitable for self-assembly of the dendrimer to form a polydendrimer encapsulating the

template; and

removing the template from the polydendrimer to give a porous polydendrimer with uniform pores of tunable size.

21. The method according to claim 20 wherein the template is chosen to give a periodic mesoporous polydendrimer.

22. The method according to claim 21 wherein the dendrimer is chosen to give a polydendrimer which is a periodic mesoporous dendrisilica.

23. The method according to claim 20 wherein the template is chosen to give a periodic macroporous polydendrimer.

24. The method according to claim 23 wherein the dendrimer is chosen to give a polydendrimer which is a periodic macroporous dendrisilica.

25. The method according to claim 22 or 24 wherein the dendrimer is $Si[(C_2H_4)Si(OEt)_3]_4$ (**1**).

26. The method according to claim 22 or 24 wherein the dendrimer is $Si[(C_2H_4)Si(Oi\text{-}Pr)_3]_4$ (i-Pr = isopropoxy) (**2**).

27. The method according to claim 22 or 24 wherein the dendrimer is $Si[(C_2H_4)Si((C_2H_4)Si(OEt)_3)_3]_4$ (**3**).

28. The method according to claim 22 or 24 wherein the dendrimer is $[((EtO)_3Si(C_2H_4))_3]SiCH_2Si[(C_2H_4)Si(OEt_3)]_3$ (**4**).

29. The method according to any one of claims 20 to 28 wherein the template is a non-ionic surfactant.

30. The method according to any one of claims 20 to 28 wherein the template is an ionic surfactant.

31. The method according to any one of claims 20 to 28 wherein the template is a colloidal crystal template.

32. The method according to any one of claims 20 to 28 wherein the template is a polymer or copolymer.

33. The method according to any one of claims 20 to 32 wherein the polydendrimer is made by polymerization of a dendrimer comprising a polymerizable group at an outmost shell of the dendrimer, and wherein the polydendrimer self-assembles prior to polymerization of the polymerizable group.

34. The method according to any one of claims 20 to 32 wherein the polydendrimer is made by polymerization of a mixture of two or more types of dendrimers, each dendrimer of the mixture of two or more dendrimers comprising a polymerizable group at an outmost shell of each dendrimer.

35. The material according to claim 33 or 34 wherein the polymerizable group is a tri-alkoxysilyl group or trichloro-silyl group.

36. The material according to claim 33 or 34 wherein the polymerizable group is a vinyl group.

37. The method according to any one of claims 20 to 36 formed as a powder.

38. The method according to any one of claims 20 to 36 formed as a film.

39. The method according to any one of claims 20 to 36 formed as a monolith.

40. The method according to any one of claims 20 to 36 formed as a fiber.

41. The method according to any one of claims 20 to 40 wherein the step

of removing the template includes heating to sufficient temperature to decompose the template, or solvent extraction, supercritical fluid extraction photolytic decomposition, or plasma etching of the template.

42. The method according to any one of claims 20 to 41 including a post-synthesis step of attaching a reactive chemical group to the dendrimers of the polydendrimer.

43. The method according to claim 38 wherein the film is made by spin-coating, dip-coating or casting a solution containing the dendrimer and template on a substrate, after which the film on the substrate is dried and thereafter the template is removed.

44. The method according to claim 39 wherein the monolith is made using a sol-gel method, wherein the dendrimers are mixed with the template in an aqueous solution to give a homogeneous sol, inducing gelation of the sol in a reaction vessel of pre-selected shape to give a monolith of pre-selected shape, after which the template is extracted with organic or inorganic solvents.

45. The method according to claim 40 wherein the fiber is made by extruding or spinning a viscous sol containing the dendrimers, the template and the solvent to produce a polydendrimer/template nanocomposite fiber, after which the template is removed from the fibers by solvent extraction to leave a porous polydendrimer.

46. A method of producing a macroporous polydendrimer, comprising the steps of:

infiltrating a dendrimer into void spaces of a colloidal crystal template comprising colloidal particles;

polymerizing the dendrimer to form a polydendrimer; and

removing the colloidal crystal template to give a macroporous polydendrimer with uniform pores of tunable size.

47. The method according to claim 46 wherein the polydendrimer is made by polymerization of a dendrimer comprising a polymerizable group at an outmost shell of the dendrimer, and wherein the polydendrimer self-assembles prior to polymerization of the polymerizable group.

48. The method according to claim 46 wherein the polydendrimer is made by polymerization of a mixture of two or more types of dendrimers, each dendrimer of the mixture of two or more dendrimers comprising a polymerizable group at an outmost shell of each dendrimer.

49. The method according to claim 46 wherein the polydendrimer is a periodic macroporous polydendrimer.

50. The method according to claim 47 or 48 wherein the polymerizable group is a tri-alkoxysilyl group or trichloro-silyl group.

51. The method according to claim 47 or 48 wherein the polymerizable group is a vinyl group.

52. The method according to claim 46 wherein the dendrimer is $Si[(C_2H_4)Si(OEt)_3]_4$ (**1**).

53. The method according to claim 46 wherein the dendrimer is $Si[(C_2H_4)Si(Oi\text{-}Pr)_3]_4$ (**2**)(i-Pr = isopropoxy).

54. The method according to claim 46 wherein the dendrimer is $Si[(C_2H_4)Si((C_2H_4)Si(OEt)_3)_3]_4$ (**3**).

55. The method according to claim 46 wherein the dendrimer is $[((EtO)_3Si(C_2H_4))_3]SiCH_2Si[(C_2H_4)Si(OEt_3)]_3$ (**4**).

56. The method according to any one of claims 46 to 55 wherein the step of removing the colloidal crystal template to give a macroporous

polydendrimer includes heating to sufficient temperature to decompose the colloidal crystal template.

57. The method according to any one of claims 46 to 55 wherein the step of removing the colloidal crystal template to give a macroporous polydendrimer includes solvent extraction, supercritical fluid extraction, photolytic decomposition, or plasma etching of the colloidal crystal template.

58. A macroporous polydendrimer produced by the steps comprising:

infiltrating a dendrimer into void spaces in a colloidal crystal template comprised of colloidal particles;

polymerizing the dendrimer to produce a polydendrimer; and

removing the colloidal particles to give a macroporous polydendrimer with uniform pores of tunable size.

59. The macroporous polydendrimer according to claim 58 wherein the polydendrimer is a periodic macroporous polydendrimer.

60. The method according to any one of claims 20 to 28 wherein the template is a combination of molecular, polymer or colloidal templates, to produce a porous polydendrimer having at least two different sizes of pores.

61. A method of synthesizing a periodic mesoporous macroporous polydendrimer comprising infiltrating a dendrimer and a mesoscale template into a macroscale colloidal template material under conditions suitable for polymerization of the dendrimer followed by removing both the mesoscale and macroscale template materials from the polydendrimer/template composite to give a periodic mesoporous macroporous polydendrimer (PMeMaP).